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Can a Cognitive Errors Algorithm Improve Clinical Decision-Making Among Medical Students in a Simulation-Based Course?

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transfer population at our institution. In order to help inform and develop a resident curriculum around ED transfers.

Methods: This is a retrospective chart review with a primary outcome measure of diagnostic error in the ED transfer population. Diagnostic error was defined as a discrepancy between the diagnosis made by the EM attending notes and the final diagnosis made by the admission team on discharge. The study was performed at an urban, academic tertiary care referral center with an affiliated 3 year EM residency. All patients transferred to the ED between 07/2016 and 09/2016 were eligible. There were 1785 ED transfer patients during this time period. We did a power calculation using an error rate of 0.13% (from previous published data from our institution for all-comers) with an expected error rate of 2% in the ED transfer population requiring at least 102 cases for an alpha of 0.05% and power of 80%. Individual records of 143 randomly selected patients were reviewed. Diagnostic discrepancies between these items were reviewed by two blinded attending physicians and adjudicated as errors if the diagnosis occurred within the first 24 hours of the hospitalization, was not documented for in the ED note and if the two reviewers agreed it was a missed ED diagnosis.

Results: The average age was 60 for the population studied and 51% were male. Four errors were found among the 143 patients for an error rate of 2.8% (CI 0.1-5.5). Diagnostic errors from all-comer ED population to the ED transfer population were compared (p= 0.002).

Conclusions: In this single tertiary center study, the diagnostic error rate was found to be 21 times higher in the ED transfer population than all comers to the ED. This could be due to multiple issues, including the fact that many patients are transferred to a tertiary care facility because they are medically complex or hemodynamically unstable. In this unique population an educational curriculum centered around the transfer population, anchoring bias, and cognitive debiasing strategies may improve care.

8 Ballistic Gelatin Training Models versus Human Models for the Training of Emergency Physicians Resident Physicians in the Sonographic Evaluation of Deep Vein Thrombosis

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Background: Trained emergency physicians can perform DVT diagnostic ultrasound with high sensitivity and specificity. Ultrasound education involves a cognitive as well as a technical component. Live models with pathology may not be readily available and commercially available

phantoms may be prohibitively expensive. Simulation has been shown to increase learner confidence, reduce complications of procedures, decrease costs, and improve patient outcomes in a number of ultrasound applications.

Objectives: To compare the OSCE and written examination scores of emergency medicine residents who trained on a simulation model we created from ballistics gelatin versus human models.

Methods: Prospective study of 32 PGY 1-3 emergency medicine residents. Institutional Review Board approval was obtained. A 30-minute lecturer reviewed probe selection, lower extremity venous anatomy, and the major diagnostic criteria of compressibility. Each PGY class was split into two groups. Residents in the gelatin phantom group scanned the two phantom models, one with patent "veins" and the other with abnormal areas of non-compressibility. Residents in the human model group scanned two patients, one with a DVT and one healthy volunteer. After the training, residents completed an OSCE as well as a written examination interpreting 14 DVT ultrasound examinations.

Results: The live model and simulation trainer groups had a similar number of previous ultrasound scans performed. There was no statistically significant difference between either of the knowledge assessments for those who trained on the live model or simulation trainer. There were no significant differences between the two groups when asked to rate their preparedness and confidence in performing a DVT ultrasound evaluation.

Conclusions: We were able to create DVT phantom models from ballistics gelatin to train EM residents how to perform and interpret a DVT compressibility study. The phantom modes were inexpensive, durable, and easy to use. OSCE and written examination scores from EM residents that practiced on these phantoms were not statistically significant from those that did their hands-on training on human models. For this application, ballistic gelatin phantom models were as effective as training on human volunteers and may be considered as a cheaper, more readily available alternative.

9 Can a Cognitive Errors Algorithm Improve Clinical Decision-Making Among Medical Students in a Simulation-Based Course?

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Background: The study of cognitive errors in emergency medicine has become increasingly popular as physicians seek ways to increase patient safety and minimize patient morbidity and mortality. However, most studies that have focused on cognitive errors are retrospective and thus prone to hindsight bias. Furthermore, it is unclear whether

an understanding of cognitive errors alone can prevent emergency physicians from making the same types of biases in thinking while working in the busy, unpredictable atmosphere of the emergency department. A cognitive errors algorithm taught to medical students and resident physicians may be a better approach towards promoting both comprehension of cognitive errors and how to utilize this knowledge when taking care of diagnostically challenging patients.

Objectives: The focus of this pilot study was to introduce a simple cognitive errors algorithm to 4th year medical students in a simulation-based course and evaluate whether it improved their performance in diagnostically challenging SIM cases and enhanced knowledge retention compared to students without prior cognitive errors training.

Methods: This was a prospective randomized study involving 10 4th year medical students enrolled in a simulation course on the management of common floor emergencies. Medical students were randomized using an online tool into group 1 (n = 5), which received an introduction to cognitive errors and use of a cognitive errors algorithm (see attached figure) for their simulation cases, or group 2 (n = 5), which performed their simulation cases before receiving an introduction to cognitive errors. Both groups were evaluated during their simulation cases for completion of critical actions utilizing a standardized checklist. Both groups completed a pre-test assessing their knowledge of the simulation case topics and a one-month delayed post-test assessing for knowledge retention. All medical students completed a survey about the course and their perceptions of cognitive errors in medicine.

Results: There was no change in average score from pre-test to delayed post-test in both groups. On review of the checklists of critical actions undertaken during the simulation cases, group 1 completed more critical actions than group 2 in 3 out of the 4 simulation cases and achieved the correct diagnosis in all of the cases, whereas group 2 determined the correct diagnosis in only 3 out of the 4 cases. 90% (9/10) of medical students surveyed were very interested in learning more about cognitive errors and planned to incorporate their knowledge of cognitive errors into their clinical management. All of the medical students in group 1 (5/5) agreed or strongly agreed that the cognitive errors algorithm was a helpful strategy for the diagnosis and management of patients.

Conclusions: Although there was no difference among the groups in terms of knowledge retention on multiple-choice tests, the group with cognitive errors training performed better at completing critical actions and achieving the correct diagnosis in a simulation setting. Overall, medical students were enthusiastic about the study of cognitive errors and believed that a cognitive errors algorithm could be a helpful diagnostic aid. Larger

studies using different modalities such as video assessment or in-situ simulation to assess trainee performance and knowledge retention are needed.

Cognitive Errors Algorithm

1. Create differential
2. Select most likely or working diagnosis
3. Determine the worst-case scenario
4. Consider potential biases (anchoring, premature closure, context errors)
5. Make plan that addresses worst-case scenario and assesses for key illnesses within differential

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Comparison of High-Fidelity Simulation versus Case-Based Discussion on Fourth-Year Medical Student Performance

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Background: Medical students are often prepared for clinical challenges with small group didactics featuring case-based scenarios. In recent years, simulation has also emerged as a valuable training tool. However, there is limited data on which format leads to improved student performance.

Objectives: We hypothesize that high-fidelity simulation allows for improved self-efficacy, knowledge, and clinical performance among fourth-year medical students (MS4s) on their emergency medicine (EM) clerkship, compared to traditional case-based discussion.

Methods: This study is a randomized, prospective, crossover study involving MS4s at an academic institution on their EM clerkship in the 2016-2017 academic year. At this institution, MS4s undergo 12 hours of small group didactics with case-based discussion prior to clinical shifts. At the start of the EM clerkship, MS4s were randomized into two groups: one group had high-fidelity simulation for the altered mental status (AMS) unit and case-based discussion for the chest pain (CP) unit; the second group had case-based discussion for the AMS unit and high-fidelity simulation for the CP unit. Thus far, 45 students have been randomized (Fig 1).

Students completed a self-efficacy survey, as well as a multiple-choice questionnaire (MCQ) featuring content from the CP and AMS units. They were also individually assessed on performance in an AMS and CP simulation scenario with a novel evaluation tool based on ACGME EM Milestones and AAMC Core Entrustable Professional Activities. This video data is still being reviewed.

Results: Students reported increased confidence